to: ISO/TC184/SC4/WG10

cc: SC4/QC CMT	**cc: SC4/WG3**	**cc: SC4/WG12**
cc: SC4/PPC	**cc: SC4/JWG9**	**cc: SC4/WG11**
	cc: SC4/WG2	

Proposal for

SSDM : STEP/SC4 Data Modeling Framework

= Working Draft : V0.9 =

January 19, 1999

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I Author's Intention

The author is intending to contribute and encourage the integration efforts for preparing the second and future release of STEP/SC4 Standards.

II The purpose of "SSDM : STEP/SC4 Data Modeling Framework" is to provide following guidelines, [4]:

(1) Classification Method and Structure for APs
(2) Requirements for Integration and Inter-operability of APs
(3) Classification Method and Structure for AIRs and AIC Library
(4) Criteria for prioritizing and coordinating the AP/AIC Development / Integration Projects
(5) Check List for PWI/NWI Proposal of AP Development

III This documents is

(1) succeeding the studies in early stage of STEP AP development and integration efforts performed in NIST, USA, in 1991, documented in [4], and,
(2) enhancing the above studies, based on the observations of current status and trends of STEP/SC4, and preparation for the second and future STEP/SC4 Standards.

Introduction

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1 Scope

1.1 In Scope

-- Preliminary --

(1) Observation of the Real World
(2) Integration Requirements for APs
(3) Principles for AP Framework
(4) Principles for Common Resources Framework
(5) Classification of Data Category

1.2 Out of Scope

-- Preliminary --

(1) Standardization of “Industrial Framework”
(2) Standardization of “Technical Terms” for Real Industry
(3) Directives and Process for STEP/SC4 Standards Development, defined in [12]

2 Normative References

-- Preliminary --

(1) ISO 10303-1 Part 1 : Overview and Fundamental Principles
(2)

3 Definitions and abbreviations

3.1 Terms defined in ISO 10303-31

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3.2 Other definitions

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3.3 Abbreviations

-- Preliminary --

AAM : Application Activity Model
AIC : Application Interpreted Construct
AIR : Application Integrated Resource

AP : Application Protocol
ARM : Application Reference Model
CC : Conformance Class
CR : Common Resources
IR : Integrated Resource
GIR : Generic Integrated Resource
GUoF : Generalized Unit of Functionality
NWI : New Work Item
PWI : Preliminary New Work Item
SSDM : STEP/SC4 Data Modeling
STEP : Standard for the Exchange of Product data model
UoF : Unit of Functionality

4 Observation of the Real World

4.1 Industry Structure : “Hierarchical Supply Chain”

Industries, in the real world, are structured in the “Hierarchical Supply Chain”, and each industrial firm and/or its business unit is living in this environment (Fig-4.1).

Social Infrastructures are identified at the top level on that chain, and Raw Material Process Industries are identified at the bottom level; in another words, they are identified as Downstream Industry back to Upstream Industry, correspondingly.

Over that scheme, Owner of Social Infrastructures, Process Plant and Building, and Transportation Business Firms are play the role of Operators. Such Owner Operators and End Users of Private Consumers are identified at the Summit Position over that chain.

4.2 Life-cycle Activities and Business Function / Discipline

4.2.1 Life-cycle Activities

Life-cycle Activities could be modeled into following decomposition (Fig-4.2.1).

(1) Life-cycle Configuration Management
(2) Design and Engineering
(3) Business Management

4.2.2 Business Function / Discipline

Industrial Firms are comprised with lot of Business Functions and/or Disciplines, to perform the Life-cycle Activities. (Table-4.2.2)

4.3 Industry vs. Business Function / Discipline

Business Functions and/or Disciplines working for each Industrial Sector are identified in a Matrix of Industry vs. Business Function and/or Discipline (Table-4.3)

Almost all Business Functions and/or Discipline are working commonly in various industries. While, there are some specific and/or deeply specialized Business Functions and/or Disciplines are devoting to Product and/or Industry specific requirements.

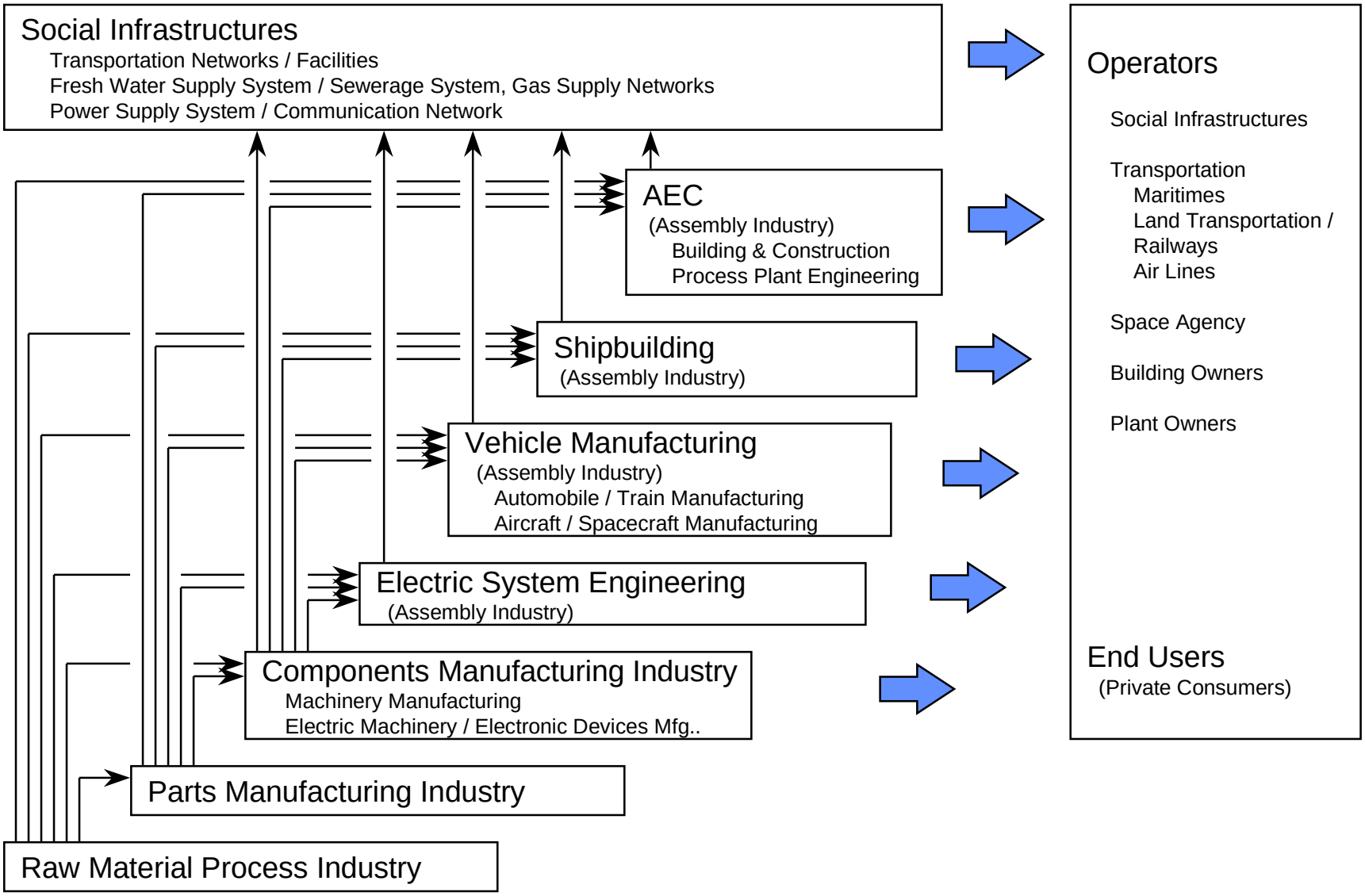

Fig-4.1 Industry Structure : "Hierarchical Supply Chain"

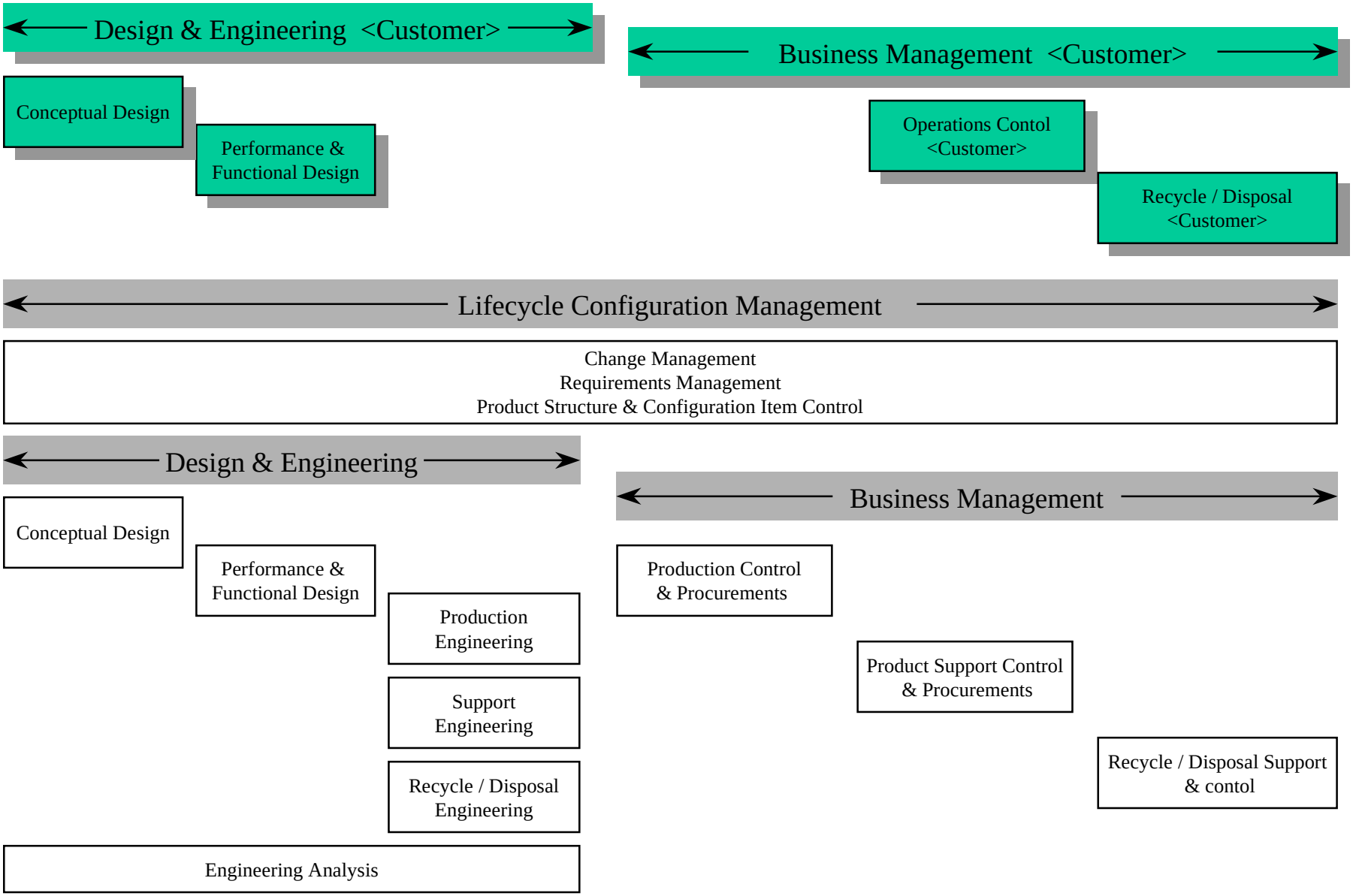

Fig-4.2.1 Life-cycle Activities

Table-4.2.2-1 Business Function and/or Discipline

1	Lificycle Configuration Management
1.1	Change Management
1.2	Requirements Management
1.3	Product Structure & Configuration Item Control

2	Design & Engineering
2.1	Conceptual Design
2.1.1	Requirements Definition
2.1.2	Specifiction Definition
2.2	Performance & Functional Design
2.2.1	External Surface Design
2.2.2	Spatial Arrangements
2.2.3	Functional System Schematic Design
2.2.4	Equipment Specification Definition
2.3	Production Engineering
2.3.1	Structure Design, Manufacturing & Construction
2.3.2	Foundations Design & Construction
2.3.3	Outfitting Design, Manufacturing & Installation
2.3.4	Mechanical Assembly / Parts Design & Manufacturing
2.3.5	Electro-Mechanical Assembly
2.3.6	Printed Circuit Assembly (incl. MCM)
2.4	Support Engineering
2.5	Recycle / Disposal Engineering
2.6	Engineering Analysis
2.6.1	Heat & Mass Balance
2.6.2	Computational Fluid Dynamics
2.6.3	Structure Analysis
2.6.4	Thermal Analysis
2.6.5	Kinematics
2.6.6	State Transition Analysis
2.6.7	Logic Analysis
2.6.8	Naval Architects
2.7	PLIB, MLIB Access
2.7.1	PLIB Access
2.7.2	MLIB Access
2.8	Product Data Library & Documentation
2.8.1	Product Data Library
2.8.2	Documentation
2.8.3	Draughting

3	Business Management
3.1	Production Control & Procurements
3.1.1	Material Requirement Planning
3.1.2	Production / Procurements Order Release
3.1.3	Parts Manufacturing Shop Control
3.1.4	Assembly Shop Control
3.1.5	Site Construction / Commissioning
3.2	Operations Control
3.3	Product Support Control
3.4	Recycle / Disposal Support & Control

Table-4.2.2-2 Business Function and/or Discipline

- 2 Design & Engineering
  - 2.1 Conceptual Design
    - 2.1.1 Requirements Definition
    - 2.1.2 Specifiction Definition
  - 2.2 Performance & Functional Design
    - 2.2.1 External Surface Design
      - 2.2.1.1 Fluid Dymanic Surface
      - 2.2.1.2 Arbitrary Free Form Surface
      - 2.2.1.3 Others
    - 2.2.2 Spatial Arrangements
    - 2.2.3 Functional System Schematic Design
      - 2.2.3.1 Process Plant System
      - 2.2.3.2 HVAC System
      - 2.2.3.3 Mechanical System
      - 2.2.3.4 Electro-Technical System
      - 2.2.3 Instrumentation & Control System
    - 2.2.4 Equipment Specification Definition
      - 2.2.4.1 Machinery
      - 2.2.4.2 Electro-Technical Equipment
  - 2.3 Production Engineering
    - 2.3.1 Structure Design, Manufacturing & Construction
      - 2.3.1.1 External Surface Structure
        - 2.3.1.1.1 Mono-coque Structure
        - 2.3.1.1.2 Others
      - 2.3.1.2 Inner Structure
        - 2.3.1.2.1 Plate / Shell Structure
        - 2.3.1.2.2 Frame / Beam Structure
        - 2.3.1.2 Others
      - 2.3.1.3 Cable Suspension Structure
    - 2.3.2 Foundations Design & Construction
    - 2.3.3 Outfitting Design, Manufacturing & Installation
      - 2.3.3.1 Piping & Tubing
        - 2.3.3.1.1 de-Cartesian Coordinate
        - 2.3.3.1.2 Others
      - 2.3.3.2 Ducting (HVACS)
      - 2.3.3.3 Cabling / Wiring
        - 2.3.3.3.1 Cable Rack & Cable Installation
        - 2.3.3.3.2 Wire Harness
    - 2.3.4 Mechanical Assembly / Parts Design & Manufacturing
      - 2.3.4.1 Mechanical Assembly / Parts
        - 2.3.4.1.1 Shape
        - 2.3.4.1.2 Design Form Feature
        - 2.3.4.1.3 Tolerances
        - 2.3.4.1.4 Mechanical Product Definition for Process Planning
        - 2.3.4.1.5
        - 2.3.4.1.6 NC Process Planning & NC Data Preparation
        - 2.3.4.1.7
      - 2.3.4.2 Design & Mfg. for Cast Parts
      - 2.3.4.3 Design & Mfg. for Forged Parts
      - 2.3.4.4 Sheet Metals Manufacturing
      - 2.3.4.5 Welding
    - 2.3.5 Electro-Mechanical Assembly
    - 2.3.6 Printed Circuit Assembly (incl. MCM)
  - 2.4 Support Engineering
  - 2.5 Recycle / Disposal Engineering
  - 2.6 Engineering Analysis
    - 2.6.1 Heat & Mass Balance
    - 2.6.2 Computational Fluid Dynamics
    - 2.6.3 Structure Analysis
    - 2.6.4 Thermal Analysis
    - 2.6.5 Kinematics
    - 2.6.6 State Transition Analysis
    - 2.6.7 Logic Analysis
    - 2.6.8 Naval Architects
  - 2.7 PLIB, MLIB Access
    - 2.7.1 PLIB Access
    - 2.7.2 MLIB Access
  - 2.8 Product Data Library & Documentation
    - 2.8.1 Product Data Library
    - 2.8.2 Documentation
    - 2.8.3 Draughting

Table-4.3 Industry vs. Business Function and/or Discipline (1/2)

Business Function and/or Discipline	Cross Industry Common APs	Industry Sector and/or Product							
		Component Mfg.		Assembly Industry / System Engineering					
		Machinery	Electric / Electronic Devices	Electric Systems	Vehicle & Craft		Ship	AEC	
					Automobile	Aircraft & Space Craft		Building & Construction	Process Plant
Lificycle Configuration Management									
Change Management	X	x	x	x	x	x	x	x	x
Requirements Management	X	x	x	x	x	x	x	x	x
Product Structure & Configuration Item Control	X	x	x	x	x	x	x	x	x
Design & Engineering									
Conceptual Design									
Requirements Definition	X	x	x	x	x	x	x	x	x
Specifiction Definition	X	x	x	x	x	x	x	x	x
Performance & Functional Design									
External Surface Design									
Fluid Dymanic Surface	X	x			x	x	x		
Arbitrary Free Form Surface	X	x	x	x	x	x	x		
Others	X	x	x	x	x		x	x	x
Spatial Arrangements	x			x	x	x	x	x	x
Functional System Schematic Design									
Process Plant System	x								X
HVAC System	x				x	x	x	X	x
Mechanical System	X				x	x	x	x	x
Electro-Technical System	x			X	x	x	x	x	x
Instrumentation & Control System	x	x	x	X	x	x	x	x	x
Equipment Specification Definition									
Machinery	X	x			x	x	x	x	x
Electro-Technical Equipment	x		x	X	x	x	x	x	x
Production Engineering									
Structure Design, Manufacturing & Construction									
External Surface Structure									
Mono-coque Structure	x				x	X			
Others	X	x	x	x	x	x	x	x	x
Inner Structure									
Plate / Shell Structure	x		x	x	x	x	X		
Frame / Beam Structure	x		x	x	x	x	x	X	x
Others	X	x		x	x	x			
Cable Suspension Structure	x			x				X	
Foundations Design & Construction	x			x	x	x	x	X	x
Outfitting Design, Manufacturing & Installation									
Piping & Tubing									
de-Cartesian Coordinate	x		x		x		x	x	X
Others	X	x			x	x			
Ducting (HVACS)	x				x	x	x	X	x
Cabling / Wiring									
Cable Rack & Cable Installation	x			X			x	x	x
Wire Harness	x	x	X		x	x			

Legend : x : Cross Point, X : Candidate Representative Industry for specific Business Function / Disipline, = : ditto
PLIB : Parts Library, MLIB : Material Library, MCM : Muliti-Chip Module, SGML : SGML Family of Standards

Table-4.3 Industry vs. Business Function and/or Discipline (2/2)

Business Function and/or Discipline	Cross Industry Common APs	Industry Sector and/or Product							
		Component Mfg.		Assembly Industry / System Engineering					
		Machinery	Electric / Electronic Devices	Electric Systems	Vehicle & Craft		Ship	AEC	
					Automobile	Aircraft & Space Craft		Building & Construction	Process Plant
Mechanical Assembly / Parts Design & Manufacturing									
Mechanical Assembly / Parts									
Shape	X	x	x		x	x	x		
Design Form Feature	x	X	x		x	x	x		
Tolerances	x	X	x		x	x			
Mechanical Product Definition for Process Planning	x	X			x	x	x		
NC Process Planning & NC Data Preparation	x	X			x	x	x		
Design & Mfg. for Cast Parts	x	X			x	x	x		
Design & Mfg. for Forged Parts	x	X			x	x	x		
Sheet Metals Manufacturing	x	x	x		x	X	x		
Welding	x	x	x		x	x	x		
Electro-Mechanical Assembly			X						
Printed Circuit Assembly (incl. MCM)			X						
Support Engineering						X			
Recycle / Disposal Engineering					X				
Engineering Analysis									
Heat & Mass Balance	x						x		x
Computational Fluid Dynamics	x	x			X	X	X		
Structure Analysis	X	x	x	x	x	x	x	x	x
Thermal Analysis	X	x	x		x	x			
Kinematics	X	x	x		x	x	x		
State Transition Analysis			X	x	x	x	x		x
Logic Analysis			X		x	x			
Naval Architects							X		
PLIB, MLIB Access									
PLIB Access	PLIB	=	=	=	=	=	=	=	=
MLIB Access	MLIB	=	=	=	=	=	=	=	=
Product Data Library & Documentation									
Product Data Library	X	=	=	=	=	=	=	=	=
Documentation	SGML	=	=	=	=	=	=	=	=
Draughting	X	=	=	=	=	=	=	=	=
Business Management									
Production Control & Procurements									
Material Requirement Planning	X	x	x	x	x	x			
Production / Procurements Order Release	X	x	x	x	x	x	x	x	x
Parts Manufacturing Shop Control	X	x	x		x	x			
Assembly Shop Control	X	x	x	x	x	x	x	x	x
Site Construction / Commissioning Control	X			x				x	x
Operations Control									
Product Support Control									
Recycle / Disposal Support & Control									

Legend : x : Cross Point, X : Candidate Representative Industry for specific Business Function / Disipline, = : ditto
PLIB : Parts Library, MLIB : Material Library, MCM : Muliti-Chip Module, SGML : SGML Family of Standards

5 Integration Requirements for APs

5.1 Data Reusability

Principal Integration Requirements is to support "Data Reusability" between both end of data exchange / data sharing partners, based on "equality" or "equal partnership" principle.

Definition of Data Reusability:
The Creator of the specific data,
can define and/or instantiate the data contents,
using the terminology of their business function or discipline,
or industry sector specific terms,
and can transfer the data to and/or can share with its user.
The User of the specific data,
can utilize the instantiated contents of the transferred / shared data
for performing their activities,
can define and/or add their own data as a creator,
and can feed back their comments and/or change request
to the original data creator.

5.1.0 Fundamental Assumption

Fundamental assumptions underlying to define the AP Integration Requirements are as follows;

(1) each company, each functional division is utilizing specific application system and/or CAx system, according to "their own choice", with "their own risks".

(2) coordination and/or negotiation to be made for selecting the applying STEP/SC4 APs and their Conformance Classes, between both end of data exchange / data sharing, based on "equal partnership" principle.

5.1.1 "Data Reusability Requirements-#1"

"Data Reusability" between "Higher" and "Lower" Industrial Firm on Hierarchical Supply Chain

The first Integration Requirement is to support "equality" of both end of "Higher" and "Lower" Industrial firm, on the hierarchical supply chain;

(1) A "Higher" Industrial firm can acquire the product item and its data, according to their own industrial data standard, from several "lower" industry firms.

(2) A "Lower" industrial firm can supply the product item and its data, according to their own industrial data standard, to various "higher" industry firms.

5.1.2 "Data Reusability Requirements-#2";

"Data Reusability" through "predecessor" and "successor" on Life-cycle Stage of the Product

5.1.3 "Data Reusability Requirements-#3";

"Data Reusability" between different Discipline

5.1.4 "Data Reusability Requirements-#4";

keeping "Commonality" of specific Discipline, working in different industries

The forth Integration Requirements is to keep "commonality" of specific discipline, working in multiple industries.

This requirement is the foundation of realizing;

(1) the Data Reusability Requirements-#1,

(2) AP Inter-operability Requirements in accordance with 5.2,

(3) Shorten the time-frame of Standards Developments, by means of reusable APs,
(4) Shorten the time-frame of Software Implementation , by means of reusable Program Modules.

5.2 AP Inter-operability

"AP Inter-operability" is the essential integration requirements to support and for realizing the "Data Reusability" requirements.

Definition of AP Inter-operability:
Data, common for multiple APs, should be defined and instantiated as a single and unique data in the shared database and / or data transfer file

6 Principles for AP Framework

6.1 Hierarchical AP Classification Structure

STEP/SC4 APs are to be hierarchically structured into three level classification of "Class—Layer—Group". (Fig-6.1)

6.1.0 Three Level Classification Structure

Classification of "Class—Layer—Group" are to be defined by following category:

(1) Class : classified by the nature of covering range of the AP
(2) Layer : classified by target Industry / Business function / Discipline of the AP, under specific Class
(3) Group : classified by the commonality of the scope, under specific Layer

6.1.1 Class

"Class" is to be classified into following four category:

(1) Class-1 : APs common for Business Function and/or Discipline
(2) Class-2 : APs for PLIB, MLIB Access
(3) Class-3 : APs for each Business Function and/or Discipline
(4) Class-4 : APs for Product Life-cycle, covering multiple Business Function / Discipline

6.1.2 Layer

Layer is to be classified into following seven category, under specific Class:

A under Class-1 : APs common for Business Function and/or Discipline
(1) Layer-1 : Product Data Library and Documentation APs
B under Class-2 : APs for PLIB, MLIB Access
(2) Layer-2 : PLIB, MLIB APs
C under Class-3 : APs for each Business Function and/or Discipline
(3) Layer-3 : Business Function / Discipline APs
(4) Layer-4 : Product / Industry Specific APs
D under Class-4 : APs for Product Life-cycle, covering multiple Business Function / Discipline
(5) Layer-5 : Product Life-cycle APs for Component Products
(6) Layer-6 : Product Life-cycle APs for Assembly Products
(7) Layer-7 : Product Life-cycle APs for Operators

6.1.3 Group

Group is to be classified by the commonality of the scope, under a specific Layer

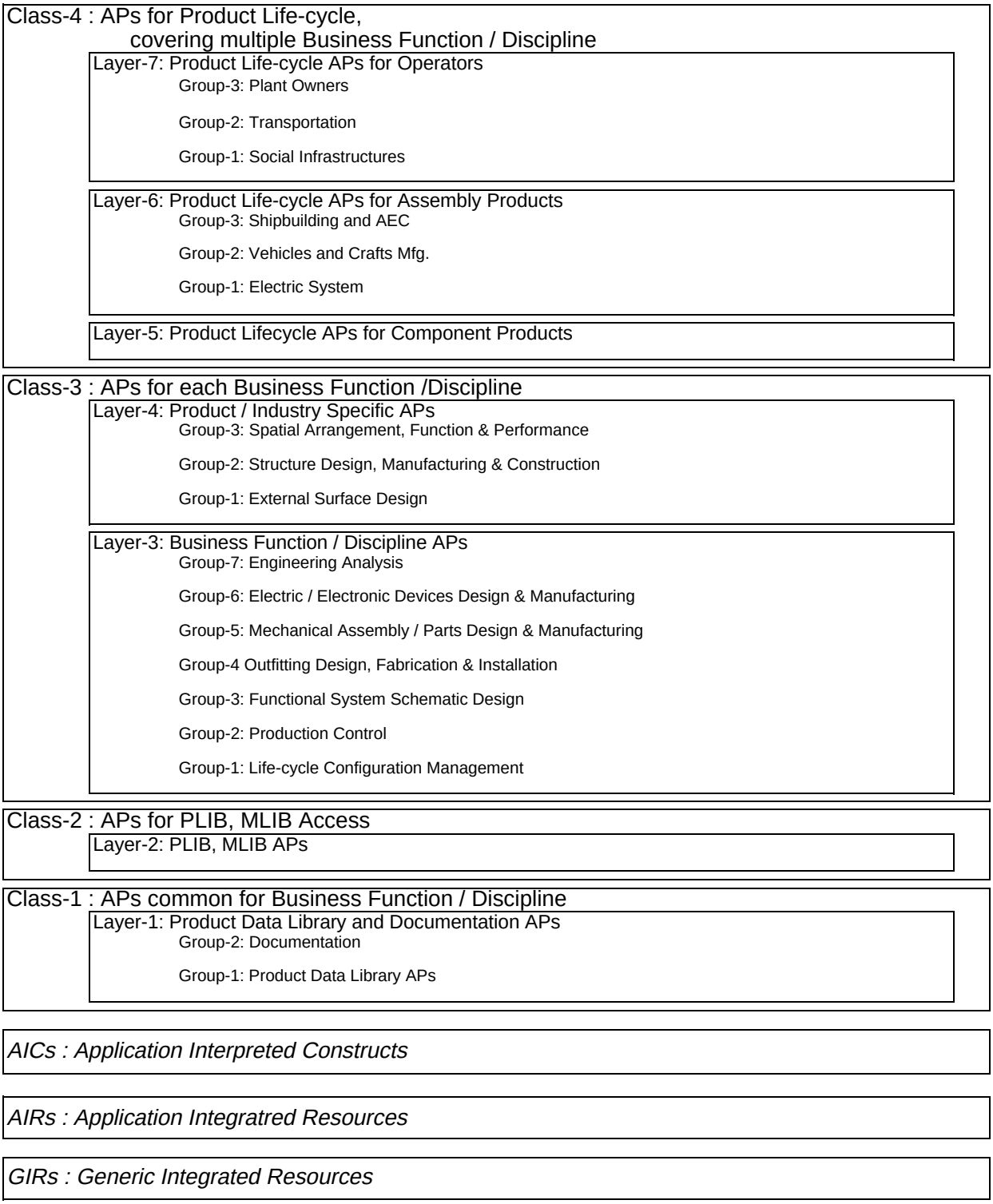

Fig-6.1 Hierarchical AP Classification Structure

6.2 Principles for APs and Conformance Classes

6.2.0 Fundamental Principles for APs

APs are to be segmented and structured principally depending on the following scope definition and terminology usage;

(1) Scope Definition
  A Single AP for a specific scope.
  B A specific scope, if it is common for multiple industry, is to be formed into single AP through cross industry coordination and integration activities.
(2) Scope Definition of Conformance Class:
  Same scope definition for each one of the conformance class of each relevant AP in different industries
(3) Terminology
  A in case of above (1)B, Common Terminology, are to be initiated by representing industry,
  B but, the industry specific terminology can be used by each industry.
(4) APs are to be segmented into the modules, so that they
  A can be integrated "plug and play" coupling, by means of "schema collection" and
  B can be assembled in a hierarchical manner.

6.2.1 Cross Industry Common APs vs. Industry Specific APs

6.2.1.1 Cross Industry Common APs

Following APs are to be developed as "Cross Industry Common AP":

(1) Class-1 : APs common for Business Function and/or Discipline
(2) Class-2 : APs for PLIB, MLIB Access
(3) Class-3 Layer-3 except Group-2: Business Function / Discipline APs.

6.2.1.2 Industry Specific APs

Following APs are to be developed as "Industry Specific APs":

(4) Class-3 Laye-3: Business Function / Discipline APs, if it is necessary,
(5) Class-3 Laye-4: Product / Industry Specific APs,
(6) Class-4 : APs for Product Life-cycle, covering multiple Business Function / Discipline

6.2.1.3 Approach and Principle for Class-3 Layer-3 APs

(1) develop the Cross Industry Common AP of 6.2.1.1
  through cross industry harmonization and integration activities;
    defining Generalized ARMs comprised with GUoFs : Generalized UoFs,
      supporting the union of information requirements of UoFs, from multiple industry.
(4) develop the Industry Specific AP of 6.2.1.2;
  customizing the "Cross Industry Common AP of 6.2.1.1";
    keeping the Scope Definition of Conformance Class,
      specializing with subsetting, adding constraint and renaming,
        using the industry specific terminology.

6.2.2 Principles for "Data Reusability Requirements-#4"; keeping "Commonality" of specific Discipline, working in different industries

(1) Cross Industry Common AP:
  "Cross Industry Common AP" realized the "Data Reusability Requirement-#4", keeping the correspondence of each Business Function and/or Discipline working in different industries

6.2.3 Principles for "Data Reusability Requirements-#1" "Data Reusability" between "Higher" and "Lower" Industrial Firm on Hierarchical Supply Chain

(1) Cross Industry Common AP:

"Cross Industry Common AP" realized the "Data Reusability Requirement-#1", keeping the correspondence of each Business Function and/or Discipline working in both end of "Higher" and "Lower" Industrial firm, Data Exchange and/or Data Sharing to be performed between that correspondence.

6.2.4 Principles for "Data Reusability Requirements-#2";
"Data Reusability" through "predecessor" and "successor" on Life-cycle Stage

(1) Define the Interface Data:
Define the interface data to be transferred / shared, in one of the part of UoF, at least in the AP of successor, who is to play the role of requester for data transfer / data sharing.

(2) Scope Definition and Conformance Class:
Same scope definition for interface data in the APs at both end.

6.2.5 Principles for "Data Reusability Requirements-#3";
"Data Reusability" between different Discipline

(1) Define the Interface Data:
Define the interface data to be transferred / shared, in one of the part of UoF, at least in the APs of receiver / requester.

(2) Scope Definition of Conformance Class:
Same scope definition for interface data in the APs at both end.

6.3 Principle for Class-4 APs covering Product Life-cycle

6.3.1 Top level APs of Class-4 Layer-5, 6, 7

Each Industry is recommended to setup a top level APs of Class-4 Layer-5, 6, 7, covering Product Life-cycle for its industry and /or product.

(1) define the life cycle AAM,
(2) define the ARM, necessary for supporting above AAM,
(3) and calling and/or referring,

A by means of "schema collection" of lower level APs, including;
Class-3 Layer-3 APs, and
their industry/product specific Class-3 Layer-4 APs, developed by themselves.

B It is not allowed Class-4 APs directly define the data model,
which are to be defined in APs of Class-3, Class-2, and Class-1

C First group of conformance classes has to define the life cycle change management and product structure and configuration item control

6.3.2 Single Integrated AP for "Product Structure & Configuration Item"

"Product Structure & Configuration Item Control" is to be developed as "Single Integrated AP" for one Product / Industry, covering whole product life cycle, to be called by above 6.3.1 (3) C.

7 Principles for Common Resources Framework

Common Resources of GIR, AIR and AIC is designed and established for assuring and keeping the consistency and integrity of Product Model Data in STEP/SC4, for realizing “AP Inter-operability Requirements”.

7.1 Principles for AIC Library

AIC is an atomic module of AIM, covering the atomic unit of a “UoF”.

AIC, therefore, is the “key stone”, which play the role of “Building Block” of STEP/SC4 Standards.

(1) AICs are to be organized corresponding to
 A each Business Function and/or Discipline, and / or
 B each “Data Category”.
(2) AICs are to be segmented into the modules, so that they
 A can be integrated “plug and play” coupling, and
 B can be assembled in a hierarchical manner.
(3) Scope Definition
 Single AIC for a specific scope, common for
 A Business Function and/or Discipline
 B multiple industry
(4) Terminology
 Common Terminology, through generalization and abstraction to support commonality for multiple Business Function / Discipline, and Industry.

7.2 Principles for AIRs

Part100 series AIRs are technical foundation for assuring and keeping the consistency and integrity establishing the APs of STEP, in conjunction with Part40 series GIRs, via AICs.

(1) AIRs are to be organized corresponding
 A each Business Function and/or Discipline, and / or
 B each “Data Category”.
(2) AIRs are to be segmented into the modules, so that they
 A can be integrated “plug and play” coupling, and
 B can be assembled in a hierarchical manner.
(3) Scope Definition
 Single AIR for a specific scope, common
 A each Business Function and/or Discipline , and / or
 B each “Data Category”.
(4) Terminology
 Common Terminology, through generalization and abstraction to support commonality for multiple Business Function / Discipline, and Industry.

7.3 Principles for GIRs

Part40 series GIRs are common technical foundation for assuring and keeping the consistency and integrity the APs of STEP, via AIRs and AICs.

(1) GIRs are to be organized “Data Category” base, supporting every Business Function and/or Discipline.
(2) GIRs are to be segmented into the modules, so that they
 A can be integrated “plug and play” coupling, and
 B can be assembled in a hierarchical manner.
(3) Scope Definition
 Single GIR for a specific scope of “data category”, common for multiple Business Function

and/or Discipline.

(4) Terminology

Common Terminology, through generalization and abstraction to support commonality for multiple Business Function and/or Discipline

8 Classification of Data Category

8.1 Data Category

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8.2 Data Category vs. Business Function / Discipline

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Tabel-8.1 Data Category (1/2)

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Tabel-8.1 Data Category (2/2)

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Table-8.2 Data Category vs. Business Function / Discipline (1/2)

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Table-8.2 Data Category vs. Business Function / Discipline (2/2)

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Annex A

Information object registration

Annex B

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Annex X Document History

(1) Proposal for STEP AP Architecture = Draft = ; V0.1, 1997.01.05 : WG10 N86?
(Initial preliminary Working Draft : for NIST Meeting)
(2) Proposal for STEP AP Framework = Draft = ; V0.2, 1997.03.06 : WG10 N96
(Second preliminary Working Draft : for and/or post Chester Meeting)
(3) Proposal for STEP/SC4 AP Framework ; V0.3, 1997.05.06 : WG10 N101
(Working Draft : for San Diego Meeting)
(4) Proposal for STEP/SC4 AP Framework ; V0.4, 1997.06.16 : WG10 N1xx
(Working Draft : post San Diego Meeting Version)
(5) Proposal for STEP/SC4 AP Framework ; V0.5, 1997.07.21 : WG10 N1xx
(Working Draft : submitted to SC4 ad-hoc Functional Requirements Team)
(6) Proposal for STEP/SC4 AP Framework ; V0.6, 1997.10.13 : WG10 N127,
(Working Draft : for Florence Meeting)
(7) Proposals for STEP/SC4 AP Framework and Related Recommendations; V0.7, 1998.01.05:
WG10 N144,
(Working Draft : for WG10 Workshop on AP Modularization, Orlando Meeting)
(8) STEP/SC4 AP Framework : Proposals and Related Recommendations; V0.8, 1998.05.25:
WG10 N171, (Working Draft : for Bad Aibling Meeting)
(9) STEP/SC4 AP Framework : Proposals and Related Recommendations; V0.8, 1998.05.25:
WG10 N188, (Working Draft : post Bad Aibling Meeting)
(10) *Proposals for* SSDM : STEP/SC4 Data Modeling Framework V0.9, 1999.0 1.19:
WG10 Nxxy, (Working Draft : for San Francisco Meeting)
Title is changed, and document is divided into two parts of *"Proposal"* and
"related Issues and Recommendations".

Annex Y Acknowledgments

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1 General comments after ISO TC184/SC4 Orlando Meeting in February 1998, reflected in V0.8:
(1) Head of UK Delegation
(2) JNC Meeting, May 15,1998.

2 V0.9 is remarkably revised based on following contributions:
(3) Comments from Mr. Chris Vaughan, EDS / Rolls Royce [11]
(4) Discussions within JNC WG10, during and after ISO/TC184/SC4 Beijing Meeting [12]
(5) The idea of “GUoF : Generalized Unit of Functionality” is found by Prof. Dr. H. Hiraoka [12]

Annex Z Author's Expectation for Discussions

I for Technical Architecture and Strategic Planing

(1) for WG10 :

A Observation of the Real World (4)
B Integration Requirements for APs (5)
C Principles for AP Framework (6)
D Principles for Common Resources Framework (7)
E Classification of Data Category (8)

(2) for QC Change Management Team and PPC :

A Integration Requirements for APs (5)
B Principles for AP Framework (6)
C Principles for Common Resources Framework (7)

II for Standards Development Activities

(3) for WG3 and JWG9 :

A Observation of the Real World (4)
B Integration Requirements for APs (5)
C Principles for AP Framework (6)
D Principles for Common Resources Framework (7)
E Classification of Data Category (8)

(4) for Joint WG3/JWG9, WG2 and WG12 :

A Integration Requirements for APs (5)
B Principles for AP Framework (6)
C Principles for Common Resources Framework (7)
D Classification of Data Category (8)

(5) for WG11 :

A Principles for AP Framework (6)
"Plug and Play" coupling of APs, by means of "Schema Collection", 6.2.0 (4) A, and "Schema Collection" mechanism for Class-4 APs, 6.3.1 (3) A
B Principles for Common Resources Framework (7)
"Plug and Play" coupling for AICs, AIRs and GIRs, 7.1 (2) A, 7.2 (2) A and 7.3 (2) A, correspondingly.

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